

6.0 ALTERNATIVES CONSIDERED AND RATIONALE FOR THE CHOSEN ALTERNATIVE

6.1 ALTERNATIVES CONSIDERED

Two alternatives for license termination were considered. The first was decontamination to allow unrestricted release in accordance with the requirements of 10 *CFR* 20.1402. The second was termination of the license with restrictions according to the requirements of 10 *CFR* 20.1403. Each of these alternatives is discussed in the following paragraphs.

6.1.1 DU Decontamination to Fulfill Unrestricted Release Criteria of 10 *CFR* 20.1402

Decontamination of the DU Impact Area to allow the termination of the NRC license without restriction would involve four major actions. These actions are discussed below:

- **Road Construction** – Clear a two-lane road into the DU Impact Area to support UXO detection and removal and DU detection and removal activities. The DU Impact Area lies within a portion of JPG where UXO is present.
- **UXO Detection and Removal** – Detect and remove UXO from the area where DU concentrations are above the limits considered acceptable for unrestricted use plus a surrounding buffer area to allow safe detection and removal of UXO. The size of the area requiring UXO removal is estimated to be on the order of several hundred acres. This area is forested and is sloped toward Big Creek. The UXO would have to be detected and removed to depths estimated at 6 to 10 ft. Both detection and removal actions would be slow because of the safety protocols and hazards associated with the presence of UXO and its removal. Removal of surface DU penetrator or penetrator fragments would occur subsequent to UXO detection and removal. The location and removal of buried UXO would disturb the local habitat. Consequently, mitigative measures would be implemented to minimize ecological impacts and erosion. Operational procedures would be defined to minimize the potential for commingling of uncontaminated DU soil with DU-contaminated soils.
- **Detection and Removal of DU Fragments and Contaminated Soil** – Detection and removal of buried DU fragments and removal of soil contaminated above free release concentrations would be completed in this stage. The examination for DU contamination would proceed immediately after an area was determined to be free of UXO (i.e., in accordance with distance requirements for UXO clearance actions). The soil in the impact trench is expected to be generally above free release concentrations. Outside of the trench, the DU contamination is expected to be highly non-homogeneous as a result of penetrators, or penetrator fragments, contacting and impacting the soil during their trajectory. Surveys for contaminated soil would occur within the DU Impact Area as well as near the firing point and along the firing lines. After areas of DU contamination above the limits for unrestricted release are identified, contaminated soil would be removed, packaged, and shipped for off-site disposal.
- **Verification Survey** – After contaminated soil is removed, a survey grid would be constructed, and a final survey would be completed to determine if the DU concentration is below the free release concentration limits.

Implementation of this alternative would require significant resources to detect and remove both UXO and DU, pose high risks to on-site personnel, and destroy the local environment. Some of these impacts are estimated to support the ALARA analysis presented in Section 7.0 of this DP.

6.1.2 License Termination Under Restricted Conditions of 10 *CFR* 20.1403

Implementing this alternative would require the establishment of land use controls¹ to limit public access to any activities within the DU Impact Area. These controls have been developed, and the U.S. Army has issued permits to allow two Federal agencies (the FWS and the USAF) to use portions of the site outside the DU Impact Area (U.S. Army 2000b and c). One of the permit conditions is to implement the land use control measures specified by the Army. The Army will audit compliance with the Army-specified control measures. Details of the land use control measures currently being implemented, which include physical, legal, and administrative measures, are provided in the MOA (Appendix A) and in Section 16.0 of this DP. The Army will ensure controls such as these are implemented and maintained in the event the MOA is terminated.

Administratively, terminating the license with restrictions would require:

- **Institutional Control Analysis** – Completion of an analysis that demonstrates that: (1) doses to the average member of the critical group would meet the requirements of 10 *CFR* 20.1403(a) with enforceable institutional controls, and (2) doses to the average member of the critical group would meet the requirements of 10 *CFR* 20.1403(e) in the event the institutional controls were no longer in effect.
- **ALARA Analysis** – Completion of an analysis that demonstrates that any residual contamination levels are ALARA.

6.2 RATIONALE FOR SELECTED ALTERNATIVE

License termination under restricted conditions was selected because this alternative meets the requirements of 10 *CFR* 20.1403 and has contamination levels that are consistent with ALARA. The cost of detecting and removing UXO and DU from the DU Impact Area to meet unrestricted release requirements is greater than the benefit that would accrue from detection and removal actions. The ALARA analysis in Section 7.0 of this DP presents related discussions.

¹According to the U.S. Department of Defense's land use control policy (DoD 2001), land use controls include any type of physical, legal, or administrative mechanism that restricts the use of, or limits access to, real property to prevent or reduce risks to human health or the environment. Physical mechanisms limit access to the property and include engineered controls and/or physical barriers. Legal mechanisms (e.g., deed notices, restrictive covenants, etc.) generally are imposed to ensure the continued effectiveness of land use restrictions. Legal mechanisms are the same as the institutional controls discussed in the National Contingency Plan. Administrative mechanisms include land use planning, construction permitting, and other measures to ensure compliance with restrictions. At Jefferson Proving Ground, all three types of land use controls are in effect. In this document, the Nuclear Regulatory Commission's "institutional controls" are synonymous with DoD's definition of "land use controls."

7.0 ALARA ANALYSIS

This chapter presents the ALARA analysis performed in support of the U.S. Army's request to terminate license SUB-1435 under restricted conditions. No additional ALARA analysis is planned to support the license termination because the proposed license termination will not involve additional site characterization or removal of DU contamination.

This analysis was conducted to determine if the residual DU contamination in the DU Impact Area is consistent with ALARA. Section 7.1 presents the ALARA analysis. The conclusions of this analysis are summarized in Section 7.2. The need for additional analyses (if any) is addressed in Section 7.3.

7.1 ALARA ANALYSIS

This section presents the quantitative ALARA analysis in support of JPG's license termination. This analysis consists of identifying and quantifying, to the extent practical, the benefits and costs (Sections 7.1.1 and 7.1.2, respectively) that would be associated with decontamination of the DU Impact Area to meet unrestricted release conditions. Because of uncertainty about the nature and extent of both UXO and DU contamination and the evolution of remediation technologies, there are uncertainties about the cost of remediation. As indicated in Section 7.2, this uncertainty does not limit the Army's ability to develop conclusions based on this ALARA analysis.

7.1.1 Benefits

Several benefits were identified as being associated with decontamination of the DU Impact Area to unrestricted release conditions. The benefits were identified using the potential benefits identified in Table D1 of the NRC's NMSS Decommissioning Standard Review Plan (SRP) [NRC 2000]. The benefits identified for the JPG include: averted population dose, avoided regulatory and institutional costs, increased land value, aesthetics, and reduced public opposition. The total discounted benefit accruing from decontamination of the DU Impact Area to terminate the license without restrictions is estimated to range from \$268,286 to \$349,429 (see Table 7-1). Sections 7.1.1.1 to 7.1.1.5 provide additional detail on each of these possible benefits.

Table 7-1. Benefits of License Termination for Unrestricted Use of the DU Impact Area Jefferson Proving Ground, Indiana

Parameter	Benefit (\$) ^a
Averted Population Dose	61,143 to 146,286
Avoided Regulatory and Institutional Costs	207,143
Increased Land Value	-- ^b
Aesthetics	-- ^b
Reduced Public Opposition	-- ^b
Total	268,286 to 353,429

^aBased on an annual discount rate of 7 percent calculated over 1,000 years.

^bBenefit is minimal to none relative to other benefits quantified.

7.1.1.1 Averted Population Dose

For the proposed license termination with restrictions, site workers, occasional visitors, and off-site individuals could be exposed to DU. Off-site receptors could come in contact with water from sources originating from the DU Impact Area.

Appendix C presents estimated doses for on-site recreationists, on-site hunters, and on-site fishermen, and water users in Bedford, Indiana, which is the nearest downstream community. Exposure pathways for the on-site receptors include external exposure, inhalation, and ingestion while the exposure pathway for Bedford water users is ingestion. Table 7-2 summarizes the annual exposure for each of these receptors and the corresponding population dose.

Table 7-2. Estimated Annual Population Dose for Restricted Reuse Jefferson Proving Ground, Indiana

Receptor	Annual Dose (mrem)		Estimated Annual Receptors	Population dose (person-rem)	
	Low	High		Low	High
On-site Hunter (2 weeks per year)	1.5	3.6	635 ^a	.95	2.28
On-Site Fisherman	3.3	7.9	350 ^b	1.15	2.76
Bedford, Indiana, Water Users	-- ^c	2.9E-6	13,768	-- ^c	0.04
Total				2.1	5.08

^aNumber of deer and turkey hunters allowed according to Interim Hunting and Fishing Plan for Big Oaks National Wildlife Refuge (NWR) [FWS 2001b].

^bBased on Interim Hunting and Fishing Plan for Big Oaks NWR, which will allow 60 fishermen per day, up to 10 days per month for 7 months (FWS 2001b).

^cOne dose estimated.

The total population dose estimate (5.08 person-rem/yr) represents a high estimate of the averted population dose that would result from decontaminating the DU Impact Area to free release conditions.

This annual population dose is converted to dollar equivalent using the \$2,000/person-rem and the 7% discount rate identified in Table D2 of the NMSS Decommissioning SRP (NRC 2000). Prior to adjustments for discounting, the annual benefit each year would be between \$4,200 and \$10,160. The total benefit from 100 years, discounted at the annual rate of 7%, would range from \$61,072 to \$147,117. Use of longer time periods does not increase the benefit substantially. The total benefit over 1,000 years, discounted at 7%, would range from \$61,143 to \$146,286.

7.1.1.2 Avoided Regulatory and Institutional Control Costs

No regulatory costs are associated with license termination under restricted and unrestricted conditions. Therefore, there is no reduction in regulatory costs for decontaminating to meet unrestricted release conditions.

The Army expects to incur approximately \$162,500 annually for implementing institutional controls costs at JPG (see Section 15.0 of this DP). Only a small fraction of this (\$14,500) is associated with the DU Impact Area. The avoided institutional control cost that would be a benefit if the DU Impact Area were decontaminated to allow unrestricted release would be \$14,500 per year. The total benefit from 100 years with an annual rate of 7% is \$206,904. Use of longer time periods does not increase the benefit substantially. The total benefit over 1,000 years, discounted at 7%, is \$207,143.

7.1.1.3 Increased Land Value

Farmland in the area of the JPG has a market value of \$3,000 to \$5,000 per acre based on classified ads in local newspapers in April 2002. The DU Impact Area is located in the central portion of the JPG and includes, and is surrounded by, areas containing UXO. It also is adjacent to an area being used for

laser-guided bombing practice. Therefore, the Army would not be able to release the DU Impact Area for other uses if it were decontaminated. Any benefit associated with increased land values would be minimal.

7.1.1.4 Reduced Public Opposition

The public has expressed concern regarding the termination of the JPG license with restrictions. This concern related primarily to possible doses to the public if institutional controls fail or DU contamination migrates. This conclusion is based on a review of the RAB meeting minutes (and review of related documentation prepared by local activist groups such as Save the Valley (STV) [STV 2001]). The benefit associated with reduced public opposition as a result of license termination for unrestricted use is difficult to quantify but is considered negligible relative to other benefits quantified in this analysis and is not quantified.

7.1.1.5 Aesthetics

The DU Impact Area is in the central portion of the JPG and covered by wood and grassy areas. There are no DU-contaminated structures that would have to be removed to meet the requirements for license termination without restrictions. In the short-term, remediation would impact the aesthetic value of the DU Impact Area negatively. Over time (5 to 10 years) and with appropriate mitigative measures implemented during remediation, the area would be restored to its present state. No additional aesthetic value is estimated to accrue for license termination without restrictions.

7.1.2 Costs

Several categories of costs were identified for decontamination of the DU Impact Area to unrestricted release conditions. These costs were also identified using the potential costs identified in Table D1 of the NMSS Decommissioning SR Plan (NRC 2000). The costs identified for the JPG are: remediation costs, occupational and public exposure at JPG, occupational non-radiological risk to on-site personnel during decontamination, radiological and non-radiological transportation risks, and environmental degradation. These cost elements are presented in Sections 7.1.2.1 to 7.1.2.5.

Because of the limited information on the distribution of the DU fragments and contamination and the unique nature of a UXO-DU remediation project, there are uncertainties associated with some of the cost estimates. For this reason, a range of cost estimates is provided to reflect the uncertainty in estimating these costs.

7.1.2.1 UXO and DU Remediation

UXO remediation of the DU Impact Area will occur sequentially. The protocol includes UXO identification and removal of surface DU fragments, followed by UXO removal down to depths of 6 to 10 ft (1.8 to 3.0 m), and identification and removal of excess DU contamination after the UXO hazard is removed.

There is uncertainty about the cost of remediation of UXO and DU within the DU Impact Area. This uncertainty is the result of several factors; the major factors include the following:

- the area and depth of DU-contaminated soil and, therefore, the area that must be cleared of UXO before DU decontamination can occur;
- the unit cost (\$/acre) for UXO detection, removal, and disposition;

- the volume of DU-contaminated soil, which is a function of the volume of soil assessed and the fraction determined to be contaminated; and
- unit costs for disposal of contaminated soil.

Table 7-3 summarizes the range of values for each of these parameters. Other parameters, such as unit transportation costs and unit disposal costs for DU metal pieces, are not reflected in this analysis; however, these parameters do not have a significant impact on total cost.

Table 7-3. Key Parameters Impacting DU Impact Area Remediation Costs Jefferson Proving Ground, Indiana

Parameter	Unit	Estimated Values	Source
Area Requiring UXO Detection, Removal and Disposition	acres	250 – 1,300	Estimate based on existing characterization information (SEG 1995, 1996)
Unit Cost for UXO Detection, Removal and Disposition	\$/acre	9,800 – 100,800	1995 JPG EIS with costs adjusted for inflation (U.S. Army 1995a)
Area Requiring Soil Survey for DU (acre)	acres	150 – 1,300	Estimate based on existing characterization information (SEG 1995, 1996)
DU Contamination Depth	ft	2 – 4	Estimate based on existing characterization information (SEG 1995, 1996)
Soil Processing Cost	\$/ft ³	3 – 6	Miller et al. 2000
Volume percent of soil determined to be contaminated with DU	percent	0.5 – 2	Estimate based on existing characterization information (SEG 1995, 1996)
Unit Cost for Contaminated Soil Disposal	\$/ft ³	5 – 17	Bentz et al. 2000

Conversion factors: Acres to km², multiply by 0.00405; ft to m, multiply by 0.3048; ft³ to m³, multiply by 0.028.

ft = foot or feet.

ft³ = cubic feet.

DU = depleted uranium.

EIS = Environmental Impact Statement.

UXO = unexploded ordnance.

The 1995 EIS for Disposal and Reuse of the JPG (U.S. Army 1995a) included estimated UXO clearance costs. These cost depend on the clearance depth and the type of land cover (bare vs. forested land). These costs were escalated to 2002 dollars using the consumer price index. The updated unit costs (\$/acre) range from about \$9,800/acre (\$40/km²) for 4 ft (1.2 m) clearance of clear land to over \$100,000/acre (\$450/km²) for 10 ft (3.0 m) clearance of forested land.

Miller et al. (2000) documented the cost and performance of excavating and screening DU-contaminated soil using a conveyor system with radiation detection systems that diverted contaminated soil from conveyor belt. The costs are assumed to be typical for detecting and sorting contaminated soil. The costs were reported as \$3.1/ft³ (\$110/m³) [neglecting mobilization and demobilization costs and \$6/ft³ (\$212/m³)] when mobilization and demobilization costs are considered.

The unit disposal costs also are variable. Bentz et al. (2000) reviews disposal costs at both commercial and DOE low-level radioactive waste disposal sites. The lowest commercial costs are those associated with Envirocare. These disposal costs are reported to range from \$4.8/ft³ to \$17/ft³ (\$170 to \$600/m³).

Other cost elements that are less significant to the overall cost estimate (detection and removal of metal penetrator fragments, packaging and transportation costs) were obtained from an earlier estimate prepared for JPG (SEG 1996).

The total cost estimate changes with changes in these major parameters. Table 7-4 summarizes the total cost estimate by remediation activity given the variation in major parameters presented in Table 7-3.

**Table 7-4. Estimated Remediation Costs
Jefferson Proving Ground, Indiana**

Remediation Activity	Estimate (\$)
UXO Detection, Removal, and Disposition	2,450,000 – 131,000,000
DU Metal Detection and Removal	854,000 ^a
Contaminated Soil Identification and Removal	39,400,000 – 1,365,000,000
Contaminated Soil Transportation and Disposal	2,000,000 – 111,000,000
Total^b	45,000,000 – 1,609,000,000

^aNot considered a major cost element; therefore, a sensitivity analysis was conducted.

^bTotal cost rounded to nearest million dollars.

DU = depleted uranium.

UXO = unexploded ordnance.

The costs presented in Table 7-4 show the potential for considerable variation in the total remediation cost estimate depending on the area and depth of soil that must be remediated and the unit remediation and disposal costs. The total cost is dominated by the cost of identifying, processing, and disposing of UXO and DU-contaminated soil.

7.1.2.2 Occupational and Public Radiological Exposure

Occupational exposures during DU remediation activities will be minimal with appropriate health and safety protocols. For example, SEG estimates of soil removal requirements suggest 16,000 person-hours to remove 500,000 ft³ (14,100 m³) of contaminated soil (SEG 1996). If similar labor requirements are required for UXO detection and removal, the total labor hours could approach 50,000 person-hours.

Assuming an occupational exposure rate on the order of 15 µR/hr (some of the higher direct exposure rates measured during the SEG characterization survey), the cumulative occupational exposure would be less than 1 person-rem. If this value was converted to a dollar equivalent at the rate of \$2,000 per person-rem, the \$2,000 total is insignificant when compared to the direct and indirect costs for remediation.

7.1.2.3 Occupational Non-radiological Risk

The estimated monetary value of the occupational non-radiological risk is presented in this section. This estimate is based on the cumulative labor requirements (50,000 person-hours), workplace accident fatality rate identified in Table D2 of the NMSS Decommissioning SRP (4.2E-8 fatalities per worker hour) [NRC 2000], and the monetary value of a fatality (\$3,000,000). This estimate is \$6,300, which also is insignificant when compared to the other remediation costs. The occupational non-radiological risk could be higher because the fatality accident rate used may underestimate the fatality risk associated with UXO.

If the UXO detection and removal fatality rate were twice the value identified in Table D2 of the NMSS Decommissioning SRP (NRC 2000), the cost would double to \$12,600, which is a small fraction of the total remediation cost.

7.1.2.4 Non-radiological Transportation Risk

Transportation of contaminated soil from JPG to the disposal site at Clive, Utah (approximately 1,750 miles from JPG), would pose risks to the public. The number of shipments depends on the area remediated and the volume of contaminated soil excavated. The number of shipments ranges from about 400 to over 11,000 based on the data in Table 7-2.

Based on the transportation accident fatality rate ($3.8\text{E-}8$ fatalities per km) identified in Table D2 of the NMSS Decommissioning SRP (NRC 2000) and the monetary value of a fatality (\$3,000,000), an estimate of the monetary value of the non-radiological transportation risk was developed. This estimate ranges from \$132,000 to \$3.67 million. While these costs are larger than those for radiological and non-radiological risk, these costs are a small percentage (0.2%) of the total remediation costs.

7.1.2.5 Environmental Degradation

Environmental degradation would result if UXO and DU detection and removal were implemented. The environmental degradation would be the result of tree and brush removal, soil disturbance in the DU Impact Area and the banks of Big Creek, and soil erosion. In the short-term, the habitat would be destroyed and the terrain modified as a result of remediation. With appropriate mitigative measures (e.g., soil erosion controls, site restoration, etc.) and over time, the site would be restored, thereby resulting in no environmental degradation costs. Therefore, no irreversible and irretrievable loss in environmental resources in the long-term is expected.

The total major ALARA cost elements for remediation of the DU Impact Area to meet requirements for unrestricted use are presented in Table 7-5. As noted in the discussion above, the ALARA costs are dominated by the direct costs for detection, removal, and disposition of the UXO and the contaminated soil.

**Table 7-5. Costs of License Termination for Unrestricted Use of the DU Impact Area
Jefferson Proving Ground, Indiana**

Remediation Cost Element	Estimate (\$)
UXO and DU Remediation Cost ^a	45,000,000 – 1,609,000,000
Occupational and Public Radiological Exposure	2,000
Occupational Non-Radiological Risk	6,300
Non-radiological Transportation Risk	132,000 – 3,670,000
Environmental Degradation	0 ^b
Total^c	45,000, 000 – 1,613,000,000

^aCost breakdown presented in Table 7-2.

^bNo environmental degradation costs are anticipated over the long-term.

^cTotal cost rounded to nearest million dollars.

7.2 ALARA CONCLUSIONS

The costs of remediation of the DU Impact Area to meet the criteria for unrestricted use are greater than the benefits. The costs are about 167 to almost 4,500 times the benefits. The ALARA analysis demonstrates that terminating the JPG license with restrictions would be consistent with the ALARA requirement of 20.1403(a).

In addition to the ALARA analysis, a “net public or environmental harm” analysis was conducted in accordance with the NMSS Decommissioning SRP (NRC 2000). This analysis compares the benefits of dose reduction with costs. These costs include occupational fatalities, occupational doses, transportation fatalities, and environmental degradation. These benefits and costs were quantified above. The benefits were estimated to range between \$268,286 and \$353,429. Table 7-6 summarizes the costs for the categories enumerated above.

**Table 7-6. Summary of Costs for “Net Public or Environmental Harm” Analysis
Jefferson Proving Ground, Indiana**

Cost Element	Estimated Cost (\$)
Occupational Fatalities (Non-Radiological)	6,300 – 12,600
Occupational and Public Radiological Exposures	2,000
Transportation Fatalities	132,000 – 3,670,000
Environmental Degradation	0
Total	140,300 – 3,684,000

This analysis indicates that for most situations, the benefits are less than the net public or environmental harm cost elements. It is expected that remediation of the DU Impact Area would most likely result in “net public or environmental harm.”

7.3 METHOD FOR SHOWING COMPLIANCE WITH ALARA AT THE TIME OF LICENSE TERMINATION

The proposed action for license termination will not generate any additional information to refine the ALARA analysis presented in this section. Furthermore, the ALARA costs are significantly greater than the ALARA benefits. Based on these considerations, no additional analysis is planned in support of license termination.

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8. PLANNED DECOMMISSIONING ACTIVITIES

Because license termination under restricted conditions is anticipated, no decommissioning tasks (i.e., DU remediation activities) are envisioned. Therefore, no related tasks will be implemented.

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9.0 PROJECT MANAGEMENT AND ORGANIZATION

This section identifies the project management and organization within the U.S. Army that is responsible for license termination of JPG's SUB-1435 (Sections 9.1 and 9.2). In addition, the key positions within this organizational structure are described (Section 9.3). Related training and contractor support are identified in Sections 9.4 and 9.5, respectively.

9.1 LICENSE TERMINATION MANAGEMENT ORGANIZATION

The key organizations supporting the license termination process include the SBCCOM, USACHPPM, Los Alamos National Laboratory (LANL), and stakeholders. Each of these organizations is described in Sections 9.1.1 through 9.1.4. The reporting hierarchy is addressed in Section 9.1.5.

9.1.1 U.S. Army Soldier and Biological Chemical Command

SBCCOM's mission is to develop, integrate, acquire, and sustain soldier and nuclear, biological, and chemical (NBC) defense technology, systems, and services and to provide for the safe storage, treaty compliance, and destruction of chemical materiel (see <http://www.sbccom.army.mil/>). SBCCOM has responsibility for completing the license termination process. This organization also identifies and manages the resources to complete this process and implements corrective action, as appropriate and necessary.

The SBCCOM Safety Office coordinates the license termination process with the NRC Headquarters and Region III, and other federal and states agencies, such as the EPA Region 5, FWS, USAF, Indiana ANG, and IDEM. SBCCOM also coordinates with the USACHPPM on health physics and radiological health issues. SBCCOM regards safety as being the responsibility of all participants in the license termination process. Concerns and corrective actions regarding the license termination process at JPG are resolved through the SBCCOM.

9.1.2 USACHPPM

USACHPPM's mission is to provide technical support for implementing preventive medicine, public health, and health promotion/wellness services into all aspects of America's Army and the Army Community (see <http://chppm-www.apgea.army.mil/>). USACHPPM's Health Physics Program (HPP) has supported the license termination process, including preparation of earlier versions of the DP and conducting the monitoring and sampling program of the DU Impact Area at JPG.

USACHPPM's Radiologic, Classic, and Clinical Chemistry Division (RCCCD) manages the radiochemistry laboratory activities for SBCCOM. RCCD provides technical assistance to the HPP and conducts all necessary laboratory analyses for samples generated for this project.

9.1.3 Los Alamos National Laboratory

LANL is a DOE laboratory, managed by the University of California. The Lab's post-Cold War mission includes efforts in threat reduction, strategic research, and stockpile stewardship. Other recent missions include nuclear emergency response, national infrastructure modeling, remote sensing, and biological agent identification and characterization (see <http://www.lanl.gov/worldview/>). LANL's Environmental Science Group has conducted initial studies, dose assessments, and modeling to support license termination.

9.1.4 Stakeholders

A RAB, an advisory organization composed of local citizens and staff from the Army, EPA, the IDEM, county officials, and members of the local communities, was established in 1994 under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the BRAC program. The RAB, which meets quarterly, provides the public and community an opportunity to identify environmental and reuse issues and concerns and to participate in the Army's decision-making process. Meeting minutes are documented and included in the JPG Administrative Record file. The U.S. Army developed and is implementing its Community Involvement Plan (SAIC 1997b) and maintains a web site to inform the public on the site closure process (<http://jpg.sbccom.army.mil/>). Public participation requirements associated with 10 *CFR* Part 20.1403 (d) are being conducted through this forum.

One of the more active organizations participating in the license termination process is Save the Valley (STV), a non-profit volunteer organization for the protection of air, water, and land in the Valley of the Ohio River between Lawrenceburg, Indiana, and Louisville, Kentucky. STV represents environmental and public interests before regulatory agencies, and at all levels of the court system, and has been an active participant in the JPG RAB (see <http://www.oldmadison.com/stv/>).

9.1.5 Lines of Authority

As the license holder, SBCCOM has responsibility for oversight, development, and execution of the license termination process and the authority to assign and manage resources within its command to this project. As Figure 9-1 indicates, SBCCOM reports to the U.S. Army Materiel Command. The key supporting organizations, USACHPPM and LANL, as well as contractors, report to SBCCOM.

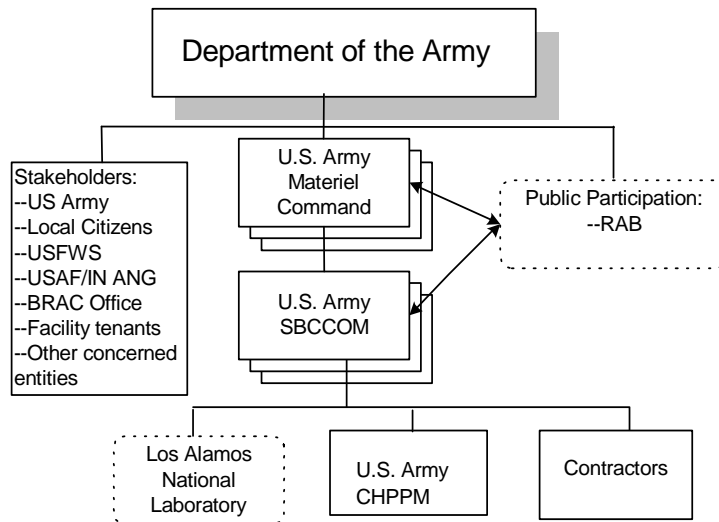


Figure 9-1. Chain of Command for the License Termination Process at Jefferson Proving Ground within the U.S. Department of the Army

9.2 DECOMMISSIONING TASK MANAGEMENT

SBCCOM is managing the development of the DP and Environmental Report (ER) for license termination at JPG. Because license termination under restricted conditions is anticipated, no decommissioning tasks are envisioned. Therefore, related tasks will not be implemented.

9.3 KEY LICENSE TERMINATION MANAGEMENT POSITIONS

The roles and responsibilities of key organizations and key positions within these organizations that support the license termination process are described briefly in this section. Table 9-1 lists the key organizations, positions, and contact information.

**Table 9-1. Key Organizations, Positions, and Contact Information for the License Termination Process
Jefferson Proving Ground, Indiana**

Organization	Position	Contact Information
SBCCOM	Radiation Safety Officer	Joyce Kuykendall (410) 436-7118 joyce.kuykendall@sbccom.apgea.army.mil
SBCCOM	BRAC Environmental Coordinator	Mr. Paul Cloud (410) 436-2381 pdcloud@sbccom.apgea.army.mil
USACHHPM	Project Manager	LTC Mark A. Melanson (410) 436-3502 mark.melansen@apg.amedd.army.mil
USACHHPM	Project Chemists	Angel Christman, Jon Beegle(410) 436-3983 angel.christmanA@apg.amedd.army.mil tom.beegle@apg.amedd.army.mil
LANL	Principal Investigator	Mike Ebinger, Ph.D. (506) 667-3147 mhe@lanl.gov

JPG = Jefferson Proving Ground.

LANL = Los Alamos National Laboratory.

LTC = Lieutenant Colonel.

SBCCOM = Soldier and Biological Chemical Command.

USACHHPM = U.S. Army Center for Health Promotion and Preventive Medicine.

9.3.1 SBCCOM

Key positions within the U.S. Army's SBCCOM include the Radiation Safety Officer (RSO) and BRAC Environmental Coordinator. The RSO coordinates and addresses radiation safety issues. This individual also reviews monitoring data; conducts annual reviews and/or audits of site activities or related policies; and recommends corrective actions, as required, to the SBCCOM.

The BRAC Environmental Coordinator manages environmental restoration activities at the installation. This individual is responsible for identifying BRAC closure requirements and implementing related measures to ensure the site closeout process is achieved.

9.3.2 USACHPPM

The Project Manager in HPP is the overall lead for USACHPPM's support to SBCCOM. This individual is responsible for project planning, control, monitoring, and completion of all technical deliverables. The Project Chemist under the RCCCD is responsible for leading radiological analytical activities and coordinates activities with the Project Manager.

9.3.3 LANL

The Principal Investigator of LANL's Environmental Science Group is responsible for leading and conducting modeling and dose assessments in support of license termination.

9.3.4 USAF/IANG

The USAF/IANG is operating an approximately 50-acre laser bombing range, a 983-acre conventional bombing range, and the Old Timbers Lodge in accordance with the MOA (see Appendix A). Under the provisions of this agreement, the USAF/IANG is responsible for infrastructure maintenance requirements and must adhere to certain restrictions on its activities relative to the DU Impact Area.

9.3.5 FWS

The FWS established and is managing the Big Oaks NWR in accordance with the MOA (see Appendix A). Under the provisions of this agreement, the FWS is responsible for infrastructure maintenance requirements and must adhere to certain restrictions on its activities relative to the DU Impact Area.

9.4 TRAINING

The Army has provided training materials and initial UXO and DU safety training to FWS and USAF/IANG personnel. After this initial training, the FWS and USAF/IANG are responsible for training their personnel and visitors in accordance with the requirements of the MOA (Appendix A). The FWS has developed a comprehensive public access plan that includes safety training and related protocols and reporting requirements (FWS 2001).

9.5 CONTRACTOR SUPPORT

Contractors are used to support the license termination process. Among the contractors is SAIC, who prepared this DP and the ER (SAIC 2002) for this project. Contractors accessing the DU Impact Area will be provided site training and will report to SBCCOM. Contractors working on-site must comply with radiation safety and license requirements.

10.0 RADIATION SAFETY AND HEALTH PROGRAM DURING LICENSE TERMINATION

Remediation of the DU Impact Area is not planned for license termination under restricted release criteria. Therefore, a radiation safety and health plan for remediation is not required.

The Army requires implementation of a health and safety plan for the environmental monitoring program currently in effect (U.S. Army 2002). In addition, the Army requires implementation of safety protocol and briefings to all visitors and workers who access the area north of the firing line. Additional details on these requirements are provided in Section 16.0 of this DP and in the permits and MOA (Appendix A).

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11.0 ENVIRONMENTAL MONITORING AND CONTROL PROGRAM

With license termination under restricted release criteria, the Army will not implement an environmental monitoring and control program. Under restricted release criteria, doses to the general public and occupational doses will be maintained ALARA pursuant to 10 *CFR* 20. Employees will be made aware of their responsibilities to the ALARA commitment through the DU safety training. Training has been provided to the FWS and USAF personnel. In addition, the FWS and USAF personnel provide site orientation training to visitors of their respective areas north of the firing line in accordance with the provisions of the MOA (Appendix A). Finally, it is noted that data from the environmental monitoring program (U.S. Army 2002) over the past 19 years indicate that DU contamination is confined to the DU Impact Area and has not migrated off-site (Ebinger and Hansen 1996).

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12.0 RADIOACTIVE WASTE MANAGEMENT PROGRAM

Remediation of the DU Impact Area is not planned for license termination under restricted release criteria. Therefore, radioactive waste will not be generated or managed.

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13.0 QUALITY ASSURANCE PROGRAM

Remediation of the DU Impact Area is not planned for license termination under restricted release criteria. Therefore, a QA program for remediation is not required.

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14.0 DU IMPACT AREA RADIATION SURVEYS

Historical site information and scoping and characterization surveys conducted in 1994 and 1995 identified specific areas within JPG that are contaminated with DU (SEG 1995c; SEG 1996). Section 4.0 of this DP describes how the radiological status of the facility was determined consistent with the guidance of NUREG-1727. Information presented in Section 4 includes descriptions of the methods and procedures as well as the results of the surveys.

The scoping and characterization surveys identified a 125-acre (0.5-km²) area within the DU Impact Area that contains the majority of residual contamination at JPG. The results indicated that soil in the immediate vicinity of, or immediately below, penetrators contain relatively high levels of DU and that soil samples collected in locations not in the immediate vicinity of penetrators contain low or background levels of DU. Surface water and wildlife samples contain background levels of radioactivity. These results indicate that residual contamination at JPG is concentrated in a heterogeneous manner in trenches located along three lines of fire and that movement of DU through the environment has been confined to the immediate vicinity of penetrators. In addition, the presence of large quantities of UXO poses risk to the individuals present in the DU Impact Area.

Results of the scoping and characterization surveys indicate that conduct of a final survey would introduce high risk to survey workers and not provide additional information needed to protect public health and safety. Based on these considerations, the Army proposes that the results of the scoping and characterization surveys be used in place of a final survey, and that collectively, the results of the surveys and dose analysis demonstrate compliance with the radiological criteria for license termination. The sensitivity and uncertainty analysis included in the dose analysis provide assurance that the dose criteria will not be exceeded given the expected variability of parameters at JPG. Because the objective of the dose analysis was to assess dose using actual concentrations of residual radioactivity as discussed in Section 3.3 of Appendix C of NUREG-1727, derived concentration guideline levels were not calculated for JPG.

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15.0 FINANCIAL ASSURANCE

This section provides information on the annual costs to support license termination (Section 15.1), certification requirements (Section 15.2), and the Army's intent to request Congressional funding to ensure compliance with restricted release criteria (Section 15.3).

15.1 COST ESTIMATE

The annual costs to support license termination, presented in Table 15-1, are approximately \$162,500. These costs are sufficient to allow an independent third party to assume responsibility for institutional controls and associated maintenance activities.

**Table 15-1. Estimated Annual Institutional Control Costs
for Jefferson Proving Ground License Termination**

Task/Activity/Component	Annual Cost (\$)
Road Maintenance	17,500.00
Perimeter Mowing	20,000.00
Perimeter Fence Inspection	96,500.00
Fence Repair	10,000.00
Fence Sign Monitor/Replace	4,000.00
DU Impact Area Surveillance	12,500.00
DU Sign Monitor/Replace	2,000.00
Total	162,500.00

Note: These are the total funds the U.S. Army would require if the MOA with the USAF and the FWS is terminated. With the MOA in effect, estimated U.S. Army expenses are approximately \$15,000.00 per year.

DU = depleted uranium.

FWS = U.S. Fish and Wildlife Service.

JPG = Jefferson Proving Ground.

MOA = Memorandum of Agreement.

USAF = U.S. Air Force.

15.2 CERTIFICATION STATEMENT

Based on the objective, scope, and approach to termination of the NRC License No. SUB-1435, as outlined in this DP, a certification statement is not required.

15.3 FINANCIAL ASSURANCE MECHANISM

As a federal government entity, the Army will satisfy the financial assurance requirement with a Statement of Intent. This statement of intent indicates that the Commanding General of SBCCOM has the authority and responsibility to request funds for implementation and maintenance of institutional controls to ensure compliance with restricted release criteria as specified in 10 *CFR* 20.1403 (b). Appendix D includes SBCCOM's Statement of Intent regarding funding requests.

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16. RESTRICTED USE

This section demonstrates that the JPG meets the requirements of 10 *CFR* 20.1403. Included in this discussion is the eligibility determination (Section 16.1), a discussion of institutional controls in place to support this action (Section 16.2), a discussion of public involvement (Section 16.3), and a summary of dose modeling and ALARA demonstration (Section 16.4).

16.1 ELIGIBILITY DEMONSTRATION

The ALARA analysis (Section 7.0) of this DP demonstrates that the existing contamination levels are ALARA given that the costs of reducing the non-homogeneous residual DU contamination intermixed with UXO are much higher than any accrued benefits. The ALARA analysis also concludes that UXO and DU decontamination activities necessary to remove residual DU likely would result in net public or environmental harm. This net public or environmental harm primarily is a result of the occupational hazards and the hazards of transporting contaminated soil to a distant disposal site (see Section 7.3). This analysis demonstrates that the Army is eligible to request release of the site under the provisions of 10 *CFR* 20.1403.

16.2 INSTITUTIONAL CONTROLS

UXO contamination is present on a large portion of the area North of the Firing Line, including the DU Impact Area, which includes DU contamination. In addition, portions of the JPG are still being used for bombing practice. Figure 16-1 shows the general location of areas with UXO, the DU Impact Area, and the active bombing areas. Because of the presence of UXO and the occasional bombing practices, access to and use of the area North of the Firing Line is limited. Agricultural, residential, or industrial activities are not permitted. To control access to and use of the area North of the Firing Line, the U.S. Army has and will continue to use a variety of institutional controls. These institutional controls and the Army's permitting system for the FWS and USAF are discussed.

The specific institutional controls¹ to be implemented by the Army include physical, legal, and administrative mechanisms. These include:

1. The U.S. Army will retain title to the JPG, North of the Firing Line.
 - The U.S. Army will control access to, and activities on, the portion of the JPG North of the Firing Line. Access to the approximately 51,000 acres North of the Firing Line is and will continue to be restricted by a fence around the entire area. Warning signs are and will continue to be posted along the fence line. No demolition, excavation, digging, drilling, or other disturbance of the soil, ground, or groundwater, or use of soil, ground, or groundwater for any purpose will be permitted without written approval of the Army. Public access will only be allowed in selected areas that have a reduced potential for the presence of UXO and no DU. These areas primarily are along the inside of the perimeter fence and on the northern portion of the JPG as shown in Figure 16-1. When public access is allowed, the visitors will receive a safety briefing on the hazards and will be required to sign a statement acknowledging the hazard and agreeing to hold the Army harmless.

¹Refer to the footnote in Section 6.0 regarding the U.S. Department of Defense's definition of land use controls. This definition includes physical, legal, and administrative mechanisms to control access to and/or use of real property. Institutional controls are legal controls under the National Contingency Plan; however, in the context of this DP, institutional controls and land use controls are synonymous. At Jefferson Proving Ground, all three types of land use controls are and will be in effect.

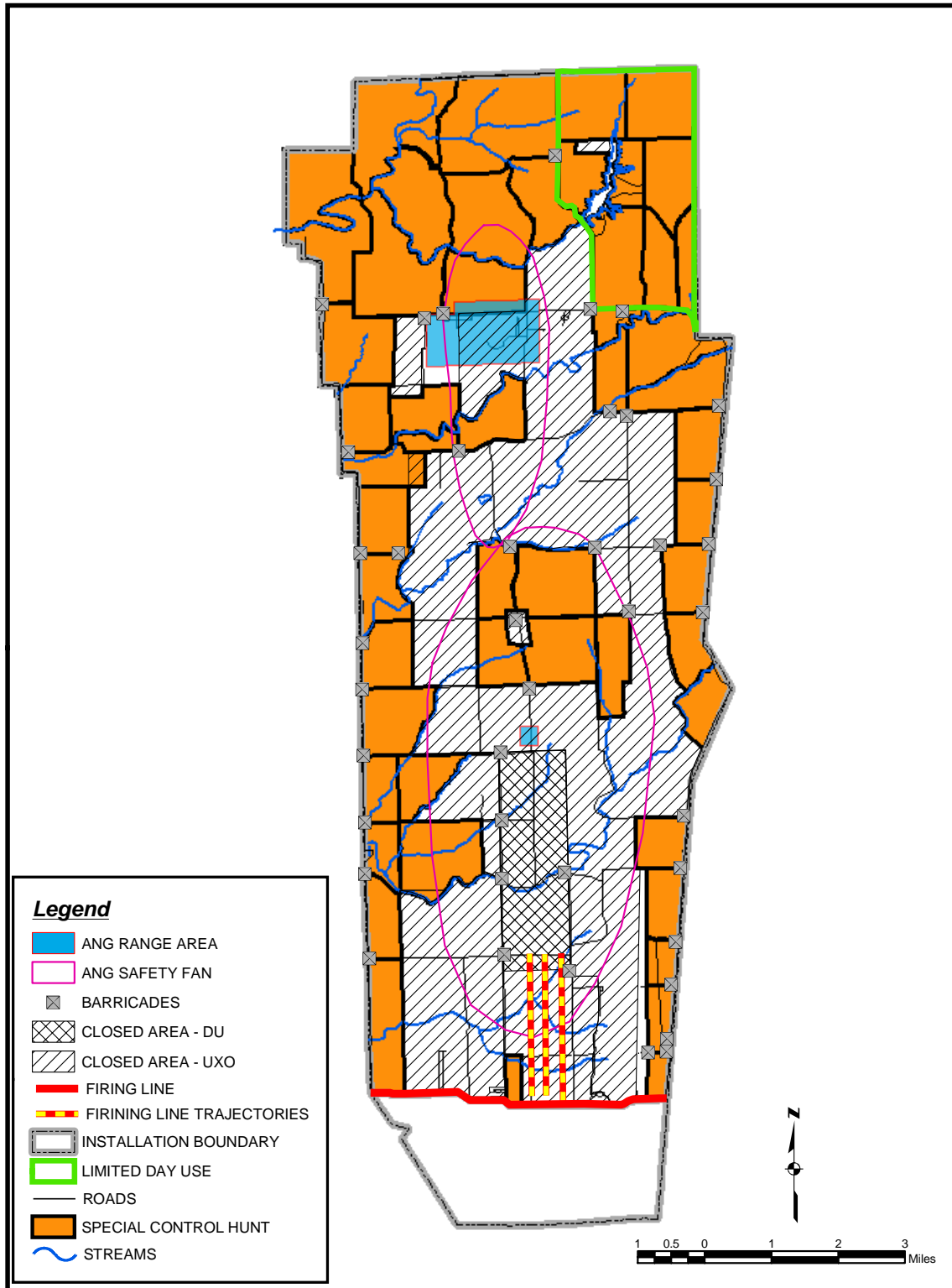


Figure 16-1. Potential Public Uses at the Big Oaks National Wildlife Refuge

3. In 1995, the U.S. Army retroceded exclusive jurisdiction over JPG to the State of Indiana (U.S. Army 1995b). Under the Interim Public Access Plan for the Big Oaks NWR (see Appendix A), the FWS, in consultation with the USAF, developed and coordinated law enforcement strategies to enforce refuge trespasses and other public use violations.
4. Additional access controls are applied to the DU Impact Area, including locked barricades on access roads and signs around the perimeter stating, “No trespassing” and “Caution – Radioactive Material.” Key access for the barricades is limited to personnel formally authorized by the U.S. Army. Quarterly lock and key inventories are conducted. Access to the DU Impact Area is limited to individuals conducting official U.S. government business.
5. The Army may authorize permits for other U.S. government agencies to use the land, but such permits will require compliance with all the controls listed above and maintenance requirements listed in this section of the plan. At the present time, the Army has an agreement with the FWS for management of the Big Oaks NWR and with the USAF for use of portions of the JPG as a bombing range (see Appendix A). The Army will conduct inspections to ensure compliance with the terms of the permit, as appropriate. If violations of the permit conditions are identified, the Army retains the right to suspend the site activities of the other government agency until appropriate corrective action is taken. The Army will conduct a formal review of the effectiveness of any permits and the effectiveness of the land use controls every 5 years.
6. Records of visitors to the area North of the Firing Line will be prepared and maintained by the federal authority (the U.S. Army or a U.S. Army-permitted federal authority) granting access to the area. The Army will also maintain a record of its review of the effectiveness of the institutional controls.

These institutional controls are planned to remain in place for the foreseeable future because of the presence of, and hazards associated with, both the UXO and DU.

16.3 MAINTENANCE

The Army, or its permitted federal agencies, will patrol and inspect the perimeter fence weekly. The inspections will be documented to show the inspection date, the inspector, and the location of any fence damage. The Army, or its permitted federal agencies, will repair any damage to the perimeter fence.

The Army, or its permitted federal agencies, also will maintain all required roads, road shoulders, low water crossings, bridges, and culverts and provide access control signs at specified locations. In addition, the Army, or its permitted federal agencies, will maintain the barricading and marking of all roads surrounding the DU Impact Area with radiation warning signs.

The Army has committed to request Congressional funding for the implementation and maintenance of institutional controls necessary to support license termination with restrictions. This commitment is presented in Appendix D of this DP.

16.4 OBTAINING PUBLIC ADVICE

The U.S. Army has solicited local input as it plans and implements its cleanup and management of the JPG. In 1994, the U.S. Army established the RAB as a voluntary advisory group. The RAB members include individuals from state and Federal regulatory agencies, as well as residents from the surrounding three counties. All of the RAB meetings are open to the public, and the Army solicits comments from the

general public in addition to the RAB members at the RAB meetings. Meeting minutes are documented and included in the JPG Administrative Record.

There are typically three to five RAB meetings a year. There have been four RAB meetings that have had extensive discussions of the SBCCOM's proposal for terminating the JPG license under restricted conditions. Among the key meetings were the January 7, 1997, May 31, 2000, February 6, 2001, and February 6, 2002, RAB meetings (SAS 1997, 2000, 2001, and 2002). These meetings discussed the institutional controls the Army proposed to NRC, controls that were identified in the August 1999 (U.S. Army 1999) and the July 2001 DPs (U.S. Army 2001).

The following list summarizes the concerns expressed by the RAB members and public on the three aspects of the proposed JPG institutional controls that are identified in 10 *CFR* 20.1403(d), specifically:

- whether the institutional controls provide reasonable assurance that the TEDE from residual DU will not exceed 25 mrem/yr,
- whether the institutional controls will be enforceable,
- whether the institutional controls will impose an undue burden on the local community or affected parties, and
- whether the financial assurances will allow an independent third party to assume and carry out the responsibilities for control and maintenance of the site.

The RAB members and public had some concerns about whether the proposed institutional controls would provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group would not exceed 25 mrem (0.25 mSv) TEDE per year. The RAB meeting minutes do not indicate there were questions raised regarding whether or not institutional controls for the Big Oaks NWR would keep visitors (hunters, fishermen, etc.) from inadvertently venturing into the DU Impact Area when there would be no fence around that specific area. The U.S. Army did discuss the hazards and costs of installing and maintaining a fence around the DU Impact Area, given the pervasive presence of UXO.

Questions were raised about the reliability of predictions about future doses when there would be no environmental monitoring to corroborate predictions about DU concentration in the various environmental media. Furthermore, there was concern about there being insufficient data on the fate and transport of DU in the environment. Questions were also asked about whether the IANG bombing practices would occur in the DU Impact Area. Such actions would disturb the site and might displace and mobilize DU. Finally, there was a concern that DU is contaminated with plutonium.

At several RAB meetings (SAS 1997, 2000, 2001, and 2002), RAB members and the public were concerned about the enforceability of the proposed institutional controls. The U.S. Army indicated that unauthorized access to the DU Impact Area would be trespassing on federal property, which is a Federal offense. STV, a local community activist group, commented on the earlier License Termination Plan (U.S. Army 2001), indicating reservations about the enforceability of the institutional controls (STV 2001).

While RAB members and some of the public expressed concerns about the uncertainty that was associated with projected future doses, and expressed a desire for the Army to continue environmental monitoring, these individuals did not articulate a concern that license termination under restrictions would impose undue burdens on the local community.

Responding to these concerns, this DP responds to these concerns by completing the following actions:

- presents an expanded discussion and analysis of exposure scenarios, including ones that involve transport and exposure of off-site personnel and the uncertainty associated with the estimates (Appendix C);
- provides an expanded discussion of institutional controls, including the enforcement of access controls by the U.S. Army or permitted federal agencies; and
- provides an expanded discussion of the license termination alternatives, including the general nature of the impacts that would be associated with achieving unrestricted release (see Section 6.0).

16.5 DOSE MODELING AND ALARA DEMONSTRATION

The summary of dose modeling for the situation where institutional controls are in place is presented in Section 5.1 of this DP. This analysis shows the dose with institutional controls in place is less than 25 mrem/yr even when using high (conservative) assumptions about average DU concentrations in the soil.

The summary of dose modeling for the situation where institutional controls are no longer in place is presented in Section 5.2 of this DP. This analysis shows the dose where institutional controls are no longer in place is less than 100 mrem/yr.

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